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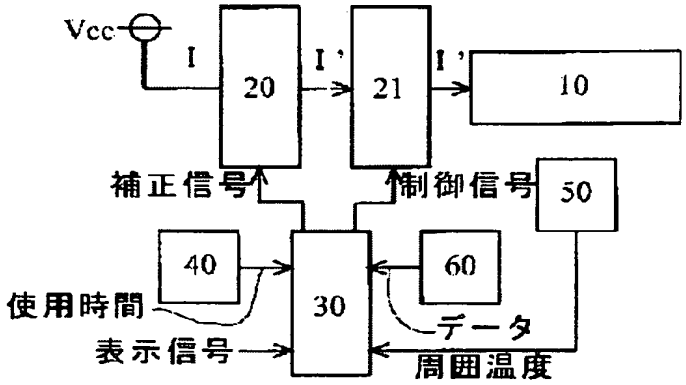
TITLE : DRIVE CIRCUIT FOR ORGANIC ELECTROLUMINESCENCE ELEMENT



ABSTRACT : PROBLEM TO BE SOLVED: To provide a drive circuit for organic electroluminescence(EL) elements in which reduction in light emitting luminance of the elements caused by the changes with time and temperature changes is suppressed and the display quality is improved.

SOLUTION: The circuit consists of organic EL elements 10 which emit light beams with luminance corresponding to the value of a current, a timer 40 which measures the operating hours of the elements 10, a sensor 50 which measures ambient temperature of the elements 10, a storage section 60 which stores the data related to the relationship among the operating hours, the ambient temperature and the light emitting luminance and a controller 30 which monitors each of signals from the timer 40 and the sensor 50, estimates the light emitting condition of the organic electroluminescence elements 10 and adjusts the value of the current based on the estimated result and the above data so as to maintain an approximately constant value for the luminance.

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the drive circuit of an organic electroluminescence element.
[0002]
[Description of the Prior Art] the organic layer (at least -- the monolayer structure of an organic luminous layer --) which consists of layers of 12 or 1 or more anode plates which consist of transparence electrical conducting materials, such as indium oxide tin (ITO), on the transparence substrate 11 as drawing 3 shows or it consists of the multilayer structure which carried out laminating formation of any, such as a hole-injection layer, an electron hole transportation layer, and an electronic transportation layer, they are from an anode plate side with the organic luminous layer -- the organic electroluminescence element 10 which has at least the cathode 14 which consists of metal electrical conducting materials, such as 13 and aluminum (aluminum) For example, it is indicated by JP,2001-117525,A.
[0003] By attaining luminescence of this organic electroluminescence element 10 with a predetermined pattern with the configuration of an anode plate 12 and cathode 14, and impressing the direct current voltage Vd of several volts - dozens of volts between an anode plate 12 and cathode 14, luminescence according to said pattern from the organic layer 13 can be seen through the transparence substrate 11, and it has the advantage whose low-battery drive by DC power supply is attained as compared with a thin film mold or distributed process input output equipment electroluminescence devices.
[0004] The so-called organic electroluminescence element of the segmental-die display which carries out division formation of either an anode plate 12 or the cathode 14 as two or more display pixel electrodes (segment) which embraced the configuration to display, and carries out selection luminescence by connecting a power source between two electrodes by using another side as a common electrode (common) has the advantage of being easy to acquire a favorite display configuration. the anode plate 12 of the organic electroluminescence element 10 shown by drawing 3 is used as segments Seg1-Seg7, and common [in cathode 14] in drawing 4 , -- the case where it is referred to as Com is shown.
[0005] Drawing 5 shows the circuitry of the organic electroluminescence element 10 shown by drawing 4 . The DC power supply to which Vcc supplies Current I, the current regulator circuit where 20 supplies current I' for DC power supply Vcc to each segments Seg1-Seg7 as predetermined, fixed applied voltage Vd, 21 is a switching circuit which supplies or stops current I' from a current regulator circuit 20 to each segments Seg1-Seg7 (ON or OFF). In a current regulator circuit 20 The constant current sections 20a-20g on which it goes [sections] into the range where the difference of the current density in each segments Seg1-Seg7 is fixed according to the area of segments Seg1-Seg7, and the luminescence brightness in each segments Seg1-Seg7 spreads abbreviation etc. and which set up applied voltage Vd according to an individual so that it may become are contained. In the switching circuit 21 for display selection, the switches 21a-21g located between the constant current sections 20a-20g and

segments Seg1-Seg7 are included.
[0006] common in an organic electroluminescence element 10 -- Com can realize a desired display by the current supply control by the switches 21a-21g which only 1 and the number of segments Seg1-Seg7 prepared the electrode for wiring, and prepared wiring for connection with external DC power supply Vcc in each segments Seg1-Seg7, i.e., a static drive.
[0007]
[Problem(s) to be Solved by the Invention] When this organic electroluminescence element 10 continues carrying out long duration luminescence, the so-called aging to which physical properties change, and luminescence brightness falls when current I' to which the resistance of organic electroluminescence element 10 self flows to segments Seg1-Seg7 by this by becoming large decreases is known (for example, refer to JP,10-254410,A).
[0008] Moreover, as drawing 6 showed, the artificer of this application checked by experiment that it was based on the difference between ambient temperature T1 and T2 and T3 (T1>T2>T3), and a difference arose in said aging. That is, drawing 6 shows change of the luminescence brightness at the time of making the initial brightness at the time of carrying out continuation luminescence into 100% within the thermostat which set two or more organic electroluminescence elements 10 of the same specification as different temperature, and the fall of luminescence brightness became early compared with the case where the case where laying temperature (ambient temperature) is high is low.
[0009] Thus, according to luminescence time amount, a display may become hard to see, and display grace is made to fall, when luminescence brightness falls.
[0010] This invention is made paying attention to such a technical problem, suppresses the fall of the luminescence brightness of the organic electroluminescence element based on aging or a temperature change, and aims at offer of the drive circuit of the organic electroluminescence element which makes it possible to raise display grace.
[0011]
[Means for Solving the Problem] The drive circuit of the organic electroluminescence element of this invention The organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current a passage according to claim 1, The timer which measures the time of this organic electroluminescence element, The sensor which measures the ambient temperature of said organic electroluminescence element, The storage section which memorizes the data about the relation between said time and said ambient temperature of said organic electroluminescence element, and said luminescence brightness, It consists of a controller which adjusts the value of said current so that each signal from said timer and said sensor may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data.
[0012] Moreover, the organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current a passage according to claim 2, The current regulator circuit which supplies said current to this organic electroluminescence element, The timer which measures the time of said organic electroluminescence element, The sensor which measures the ambient temperature of said organic electroluminescence element, The storage section which memorizes the data about the relation between said time and said temperature of said organic electroluminescence element, and said luminescence brightness, So that each signal from said timer and said sensor may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data It consists of a controller which outputs an amendment signal to said current regulator circuit.
[0013] Moreover, the organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current a passage according to claim 3, The storage section which memorizes the data about the relation between the time of said organic electroluminescence element and an ambient temperature, and said luminescence brightness, It consists

of a controller which adjusts the value of said current so that said time or said ambient temperature may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data.

[0014] Moreover, the organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current a passage according to claim 4, The timer which measures the time of this organic electroluminescence element, The storage section which memorizes the data about the relation between said time of said organic electroluminescence element, and said luminescence brightness, It consists of a controller which adjusts the value of said current so that the signal from said timer may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data.

[0015] Especially, in claim 4, said data are memorized by the storage section the passage according to claim 5 based on the result which measured using the organic electroluminescence element the same as that of said organic electroluminescence element, or of the same kind, and was searched for from claim 1.

[0016]

[Embodiment of the Invention] Although this invention is explained based on the gestalt of operation shown in drawing 1 and drawing 2 , the same sign is given to the same as that of said Prior art, or a considerable part, and detailed explanation is omitted in it. Moreover, refer to drawing 3 - drawing 6 for the part which is not shown by drawing 1 and drawing 2 in the following explanation.

[0017] Drawing 1 shows the drive circuit of the organic electroluminescence element concerning this invention, and that of an organic electroluminescence element 10, the current regulator circuit 20 which supplies current I' to the electrodes 12 and 14 (not shown) of this organic electroluminescence element 10, and the switching circuit 21 located between an organic electroluminescence element 10 and a current regulator circuit 20 is the same as that of the Prior art mentioned above, and DC power supply Vcc which supply Current I to this current regulator circuit 20 are connected.

[0018] 30 is a controller which consists of a microcomputer etc. and outputs the control signal for controlling a switching circuit 21 in response to the status signal from the outside. Receiving this control signal, a switching circuit 21 supplies or stops current I' from a current regulator circuit 20 to each segments Seg1-Seg7 (ON or OFF).

[0019] 40 is a timer for time measurement which measures the luminescence time amount (time) of an organic electroluminescence element 10, and outputs a time amount signal to a controller 30, for example, measures said time by measuring the time amount from the injection of an electric power switch (not shown) to cutoff, or measuring the count of an injection of said power source.

[0020] 50 is a sensor for temperature detection which measures the ambient temperature of an organic electroluminescence element 10, and outputs a temperature signal to a controller 30, for example, consists of thermo-sensitive devices, such as a thermistor directly stuck on the transparence substrate 11 of the organic electroluminescence 10.

[0021] In this configuration, a controller 20 inputs the time amount signal from a timer 40, and the temperature signal from a sensor 50, an amendment signal is outputted to a current regulator circuit 20 according to these, the value of current I' supplied to an organic electroluminescence element 10 is adjusted, and adjustment by the controller 30 is explained below.

[0022] Although luminescence brightness falls when the value of current I' which flows to segments Seg1-Seg7 by this by continuing carrying out long duration luminescence by physical properties' changing and the resistance of organic electroluminescence element 10 self becoming large decreases, an organic electroluminescence element 10 searches for beforehand the property about this time amount and luminescence brightness as time amount amendment data, and makes the storage section 60 memorize this.

[0023] Moreover, it asks for the rate of a fall of as opposed to [said property changes according to ambient temperature, and the fall of luminescence brightness becomes early / specifically / the case

where it is low when ambient temperature is high /, and] this temperature as temperature compensation data beforehand, and the storage section 60 is made to memorize this.
[0024] A controller 30 supervises each signal from a timer 40 and a sensor 50, guesses the condition of the luminescence brightness of an organic electroluminescence element 10, and based on said data beforehand remembered to be this result, it adjusts it so that the luminescence brightness of an organic electroluminescence element 10 may maintain the value of abbreviation regularity.
[0025] Therefore, the value of current I' which a current regulator circuit 20 outputs with said time amount amendment data memorized in the storage section 60 is increased as the time amount of accumulation becomes long by measuring the signal from the former (refer to drawing 2).
[0026] Moreover, the signal from the latter is measured per unit time basis, for example, 10 minutes, and the value of current I' supplied with said temperature compensation data memorized in the storage section 60 to from after said unit time amount progress before said following unit time amount progress is amended by asking for the mean temperature in the unit time amount. For example, if it is the mean temperature a in a certain unit time amount t1, the mean temperature b in the following unit time amount t2, and the mean temperature c in the following unit time amount t3, a controller 30 will ask for said temperature compensation data to temperature a from the storage section 60 after unit time amount t1 progress, and a current regulator circuit 20 will be controlled so that the temperature compensation data amends the value of current I' in the unit time amount t2. Moreover, a controller 30 asks for said temperature compensation data to temperature b from the storage section 60 after unit time amount t2 progress, and a current regulator circuit 20 is controlled so that the temperature compensation data amends the value of current I' in the unit time amount t3. Moreover, a controller 30 asks for said temperature compensation data to temperature c from the storage section 60 after unit time amount t3 progress, and a current regulator circuit 20 is controlled so that the temperature compensation data amends the value of current I' after it. Therefore, in a<b<c, the value of current I' becomes large gradually.
[0027] Thus, the fall of the luminescence brightness of the organic electroluminescence 10 based on aging or a temperature change when a controller 30 considers as the drive circuit which adjusts a current regulator circuit 20 can be suppressed so that the value of current I' supplied according to the time and ambient temperature of the organic electroluminescence 10 may be amended, and display grace can be raised.
[0028] In this case, when the storage section 60 memorizes based on the result measured and searched for using the organic electroluminescence element the same as that of an organic electroluminescence element 10, or of the same kind, adjustment of said data used adapted to the organic electroluminescence element 10 actually used is attained.
[0029] In addition, said unit time amount can define any value by setup for a controller 30.
[0030] Thus, supervise each signal from the timer 40 which measures the time of an organic electroluminescence element 10, and the sensor 50 which measures the ambient temperature of an organic electroluminescence element 10, and the condition of the luminescence brightness of an organic electroluminescence element 10 is guessed. It is based on the data about the relation between said time beforehand remembered to be the result of this guess and said ambient temperature, and said luminescence brightness. Although the effective thing was shown when adjusting the value of current I' supplied to an organic electroluminescence element 10 kept constant the display grace of an organic electroluminescence element 10 so that the luminescence brightness of an organic electroluminescence element 10 may maintain the value of abbreviation regularity Use either said time and said ambient temperature, and it is based on the data about the relation between it and said luminescence brightness. It is also effective to adjust the value of current I' supplied to an organic electroluminescence element 10 so that the luminescence brightness of an organic electroluminescence element 10 may maintain the value of abbreviation regularity. If said ambient temperature is used in the environment where it does not change a lot, it is effective to use said time.
[0031] By the way, luminescence of the organic electroluminescence 10 From being carried out by impressing the direct current voltage Vd of several volts - dozens of volts between an anode plate 12 and

cathode 14, as the Prior art explained in fact Amendment of the value of current I' by the controller 30 It is what is performed by fluctuating the output voltage level of a current regulator circuit 20. The value of current I' can be fluctuated by fluctuating said output voltage level directly, when said output voltage is an PWM pulse voltage, by fluctuating duty, said voltage level which becomes settled in an effective value can be fluctuated, and the value of current I' can be fluctuated.
[0032] in addition, common [anode plate / 12 / in segments Seg1-Seg7 and cathode 14] with the gestalt of said operation -- although referred to as Com, on the contrary, an anode plate 12 may be constituted in commonness and cathode 14 may be constituted in a segment. However, for forming the segment from which the anode plate 12 is easier for pattern formation, and it serves as a display, it is desirable.
[0033] Moreover, although the gestalt of said operation showed what has segments Seg1-Seg7 as a display, it cannot be overemphasized that the configuration or the number of a display are not limited to the gestalt of said operation.
[0034]
[Effect of the Invention] According to the drive circuit of the organic EL device of this invention, supervise each signal from the timer which measures the time of an organic electroluminescence element, and the sensor which measures the ambient temperature of an organic electroluminescence element, and the condition of the luminescence brightness of an organic electroluminescence element is guessed. It is based on the data about the relation between said time beforehand remembered to be the result of this guess and said ambient temperature, and said luminescence brightness. By adjusting the value of the current supplied to said organic electroluminescence element so that the luminescence brightness of an organic electroluminescence element may maintain the value of abbreviation regularity The fall of the luminescence brightness of the organic electroluminescence element based on aging or a temperature change can be suppressed, and display grace can be raised (claim 1 and claim 2).
[0035] Either said time and said ambient temperature are used, and based on the data about the relation between it and said luminescence brightness, it is also effective to adjust the value of the current supplied to an organic electroluminescence element so that the luminescence brightness of an organic electroluminescence element may maintain the value of abbreviation regularity, and a configuration can be simplified in this case (claim 3).
[0036] If ambient temperature is in the use in the environment where it does not change a lot Supervise the signal from the timer which measures the time of an organic electroluminescence element, and the condition of the luminescence brightness of an organic electroluminescence element is guessed. It is based on the data about the relation between said time beforehand remembered to be the result of this guess, and said luminescence brightness. By adjusting the value of the current supplied to said organic electroluminescence element so that the luminescence brightness of an organic electroluminescence element may maintain the value of abbreviation regularity The fall of the luminescence brightness of the organic electroluminescence element based on aging or a temperature change can be suppressed, and display grace can be raised (claim 4).
[0037] When the storage section memorizes based on the result measured and searched for using the organic electroluminescence element the same as that of said organic electroluminescence element, or of the same kind, adjustment of said data adapted to the organic electroluminescence element actually used is attained (claim 5).

[Translation done.]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current, The timer which measures the time of this organic electroluminescence element, The sensor which measures the ambient temperature of said organic electroluminescence element, The storage section which memorizes the data about the relation between said time and said ambient temperature of said organic electroluminescence element, and said luminescence brightness, So that each signal from said timer and said sensor may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data The drive circuit of the organic electroluminescence element characterized by consisting of a controller which adjusts the value of said current.
[Claim 2] The organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current, The current regulator circuit which supplies said current to this organic electroluminescence element, The timer which measures the time of said organic electroluminescence element, The sensor which measures the ambient temperature of said organic electroluminescence element, The storage section which memorizes the data about the relation between said time and said temperature of said organic electroluminescence element, and said luminescence brightness, So that each signal from said timer and said sensor may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data The drive circuit of the organic electroluminescence element characterized by consisting of a controller which outputs an amendment signal to said current regulator circuit.
[Claim 3] The organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current, The storage section which memorizes the data about the relation between the time of said organic electroluminescence element and an ambient temperature, and said luminescence brightness, So that said time or said ambient temperature may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data The drive circuit of the organic electroluminescence element characterized by consisting of a controller which adjusts the value of said current.
[Claim 4] The organic electroluminescence element which presents luminescence by the luminescence brightness according to the value of a current, The timer which measures the time of this organic electroluminescence element, The storage section which memorizes the data about the relation between said time of said organic electroluminescence element, and said luminescence brightness, So that the signal from said timer may be supervised, the condition of the luminescence brightness of said organic electroluminescence element may be guessed and said luminescence brightness may maintain the value of abbreviation regularity based on the result of this guess, and said data The drive circuit of the organic electroluminescence element characterized by consisting of a controller which adjusts the value of said

current.

[Claim 5] Said data are the drive circuit of an organic electroluminescence element given in any of claim 1 to claim 4 characterized by what is memorized by the storage section based on the result measured and searched for using the organic electroluminescence element the same as that of said organic electroluminescence element, or of the same kind they are.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The explanatory view of the drive circuit in the gestalt of operation of this invention.
[Drawing 2] A temperature profile same as the above.
[Drawing 3] The important section sectional view explaining the structure of an organic electroluminescence element.
[Drawing 4] The top view explaining the electrode configuration of a component same as the above.
[Drawing 5] The explanatory view of the drive circuit of the Prior art of a component same as the above.

[Drawing 6] The temperature profile of a component same as the above.
[Description of Notations]
10 Organic Electroluminescence Element
11 Substrate
12 Anode Plate
13 Organic Layer
14 Cathode
30 Controller
40 Timer
50 Sensor
60 Storage Section

[Translation done.]

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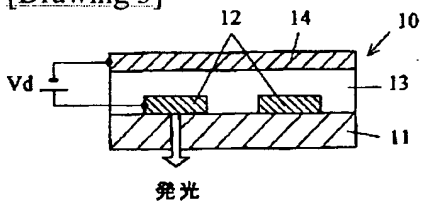
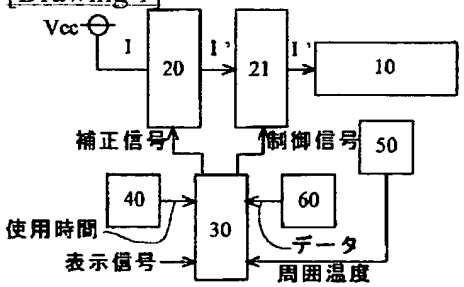
DRAWINGS

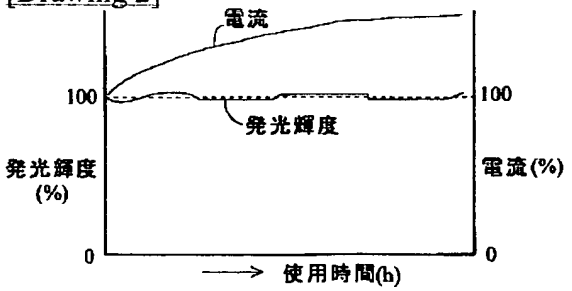
[Drawing 3]



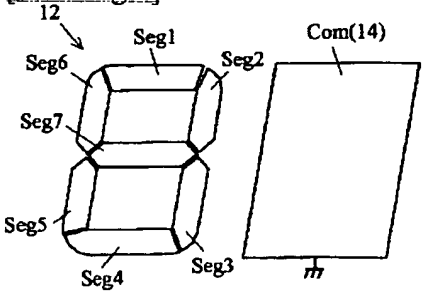
[Drawing 1]



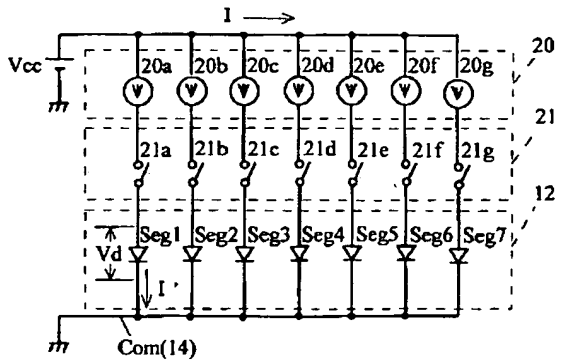
[Drawing 2]



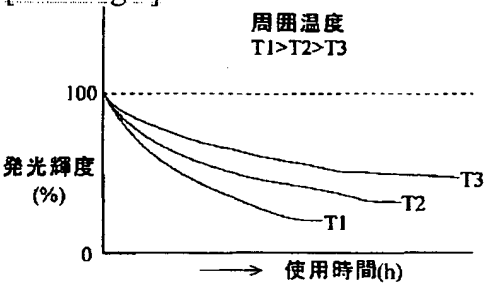
[Drawing 4]



[Drawing 5]



[Drawing 6]



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